MARCUS

Navigation and Inertial Data Products

ARM Translators have prioritized producing the following navigation and inertial measurement-related or -affected data for MARCUS:

- **NAVBE:** navigation and inertial data with added value of en route flag, beam angle, and beam angle orientation
- **NAVBE1M:** 1-min averaged NAVBE quantities with addition of course over ground and speed over ground

- **CEILSHIPCOR:** tilt and heave corrected ceilometer cloud bases
- **MPLSHIPCOR:** tilt and heave corrected Micropulse Lidar (MPL) data
- **MWACRSHIPCOR:** tilt and heave corrected moments, heave velocity corrected mean Doppler velocity

- **MWACRARSCL:** ARSCL from corrected ceilometer, MPL, and MWACR data

Data is expected to be available from the ARM Archive by August 2018.

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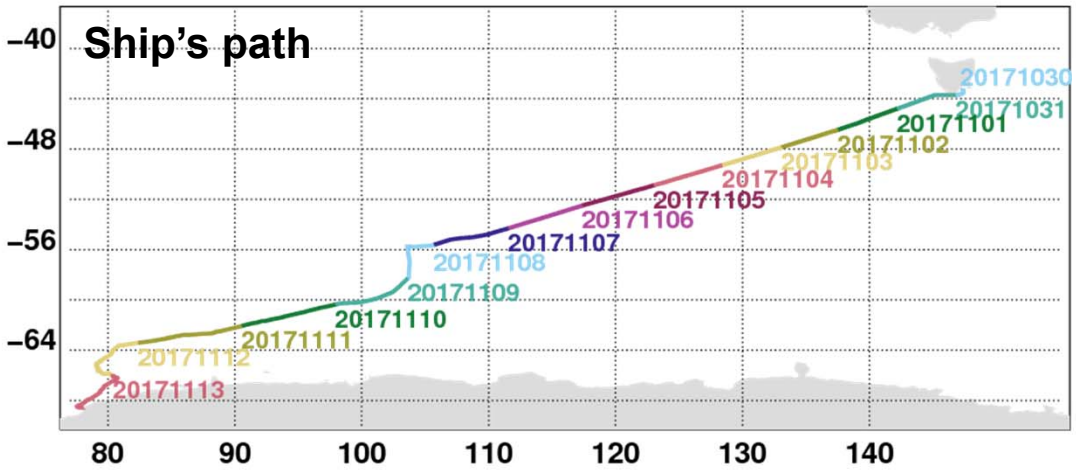
Take-away points ...

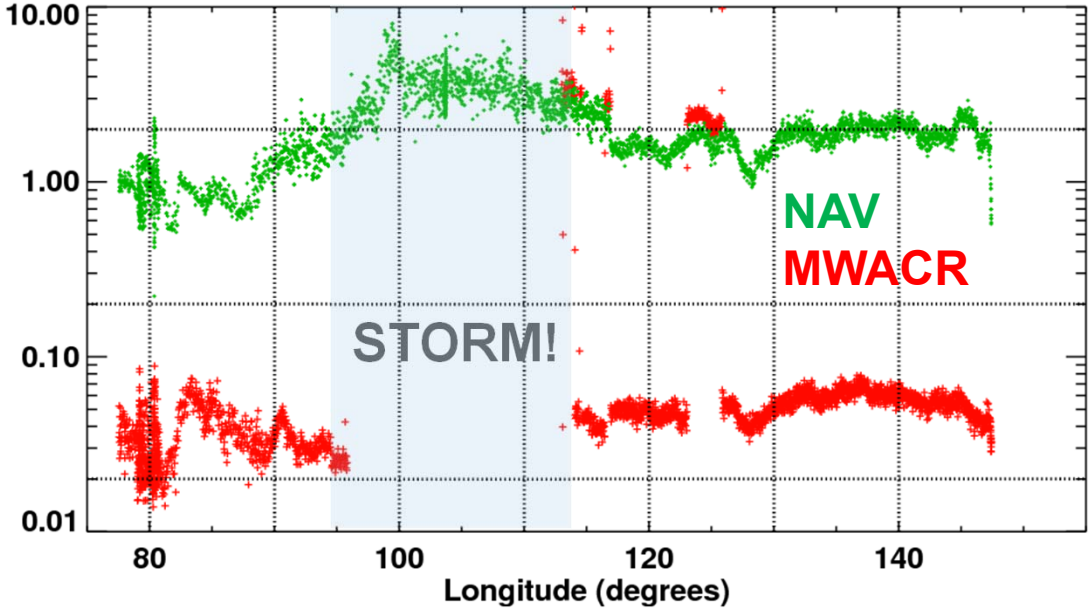
- SEANAV has done well with respect to ship attitude and location information
- MWACR is mounted on a stable platform intended to keep the radar zenith-pointing, but the MWACR was not always zenith-pointing.
- Additional corrections and/or quality control may be required for mean Doppler velocity

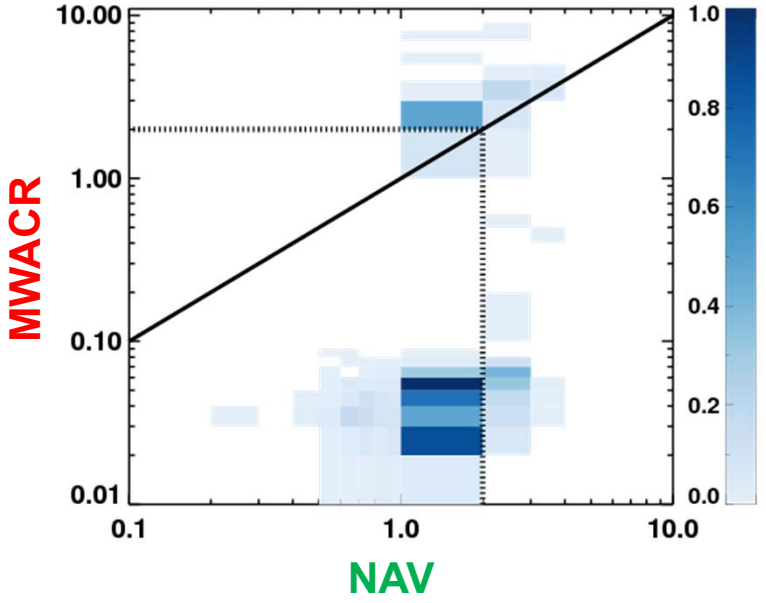
A look at MWACR's beam angle on the 1st leg



Beam angle =
angle off zenith
due to ship pitch and roll

5-min Mean Beam Angle



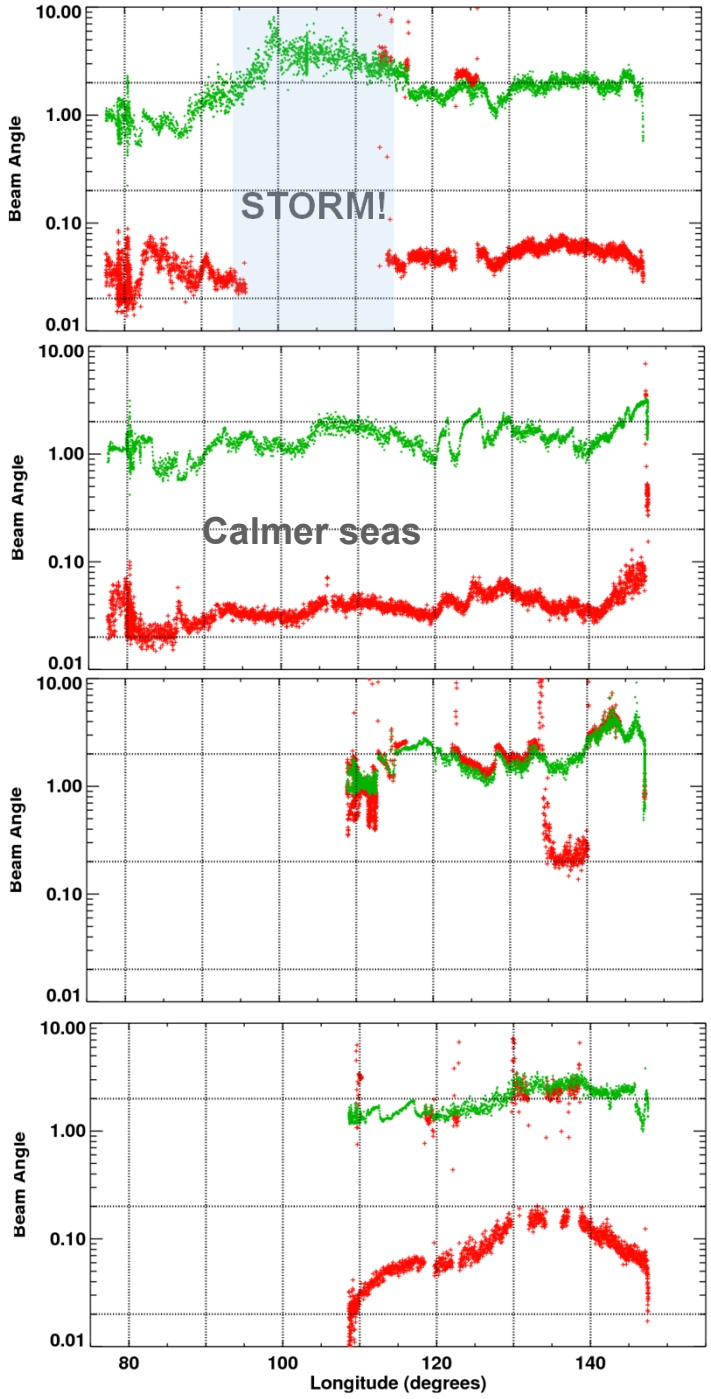


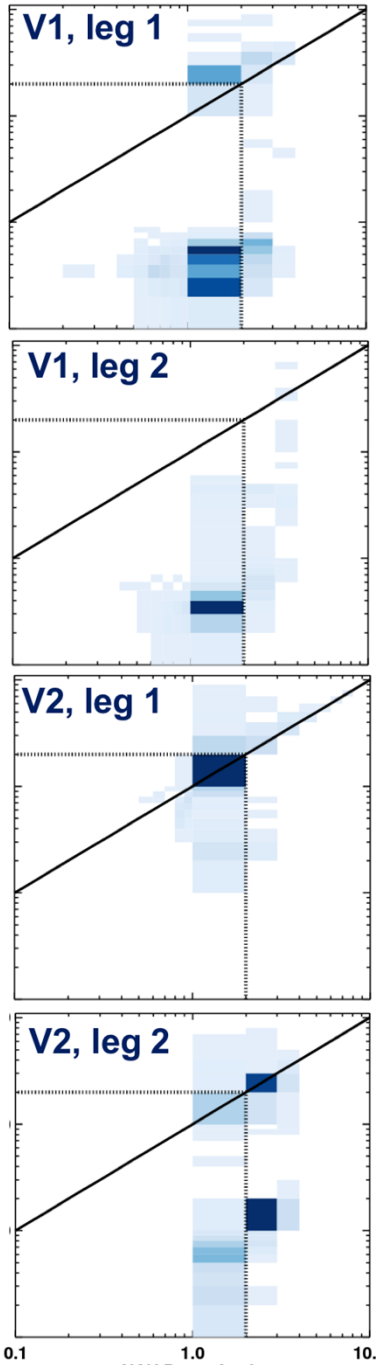
V1, leg 1

V1, leg 2

V2, leg 1

V2, leg 2





MWACR

MWACR

MWACR

MWACR

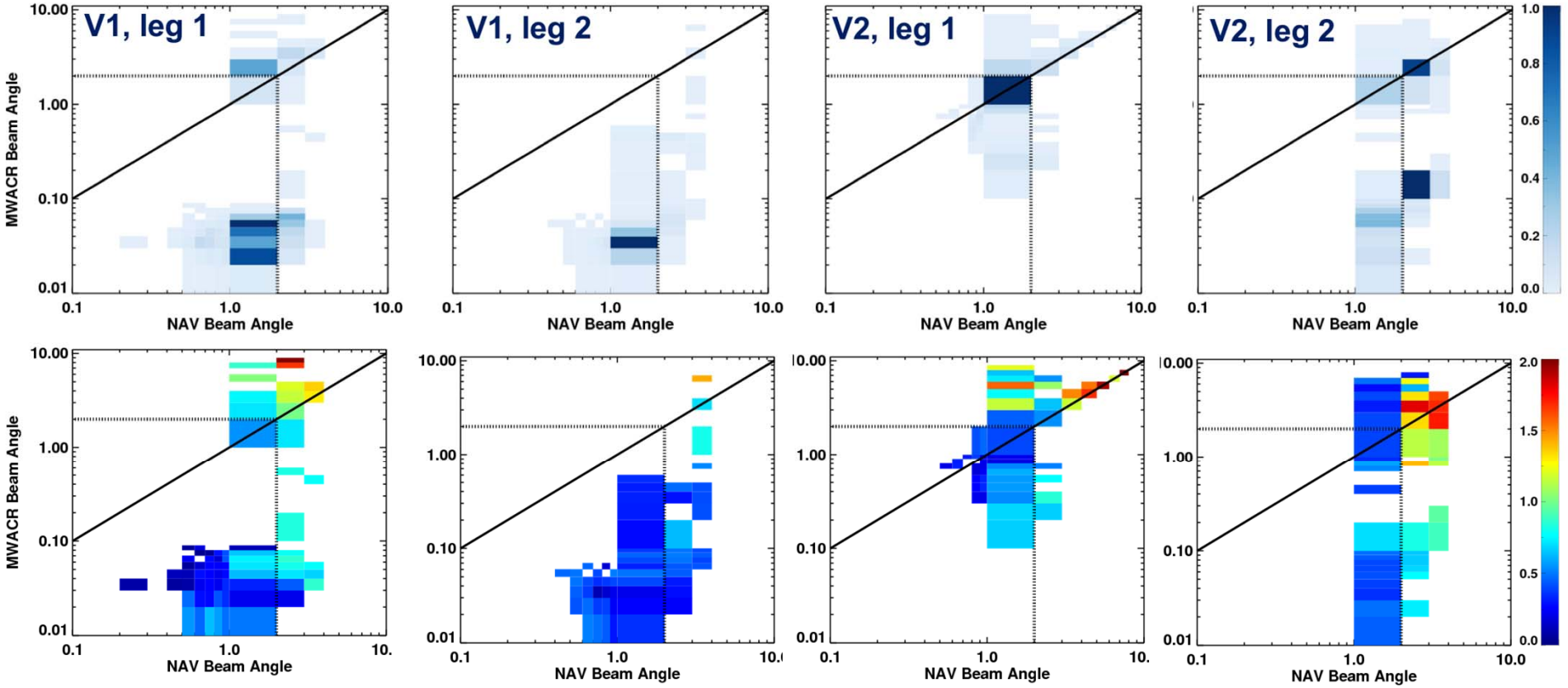
Results …

- There was a very big storm!
- Suspect something else might be going on too … lag(?)

- Lower beam angles in general
- MWACR nearly zenith-pointing always
- **MDV corrections "look" best**

- MWACR far from zenith-pointing at all times

- Higher beam angles in general
- **MDV corrections "look" worst**



Summary

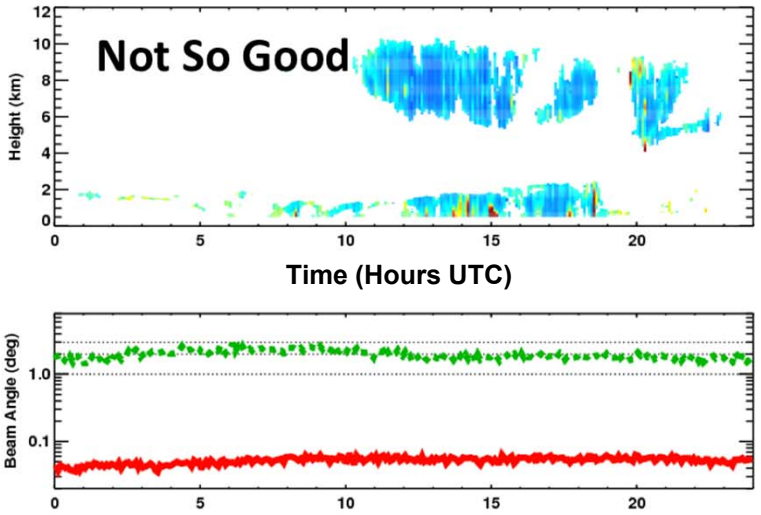
- We probably want to include a QC flag to indicate how robust the MDV correction is.
- We may want to include a correction for the horizontal wind component.
- If you intend to use the MDV, please contact

  Scott Giangrande sgrande@bnl.gov
- Navigation and ship corrected products are expected to be available in August 2018.

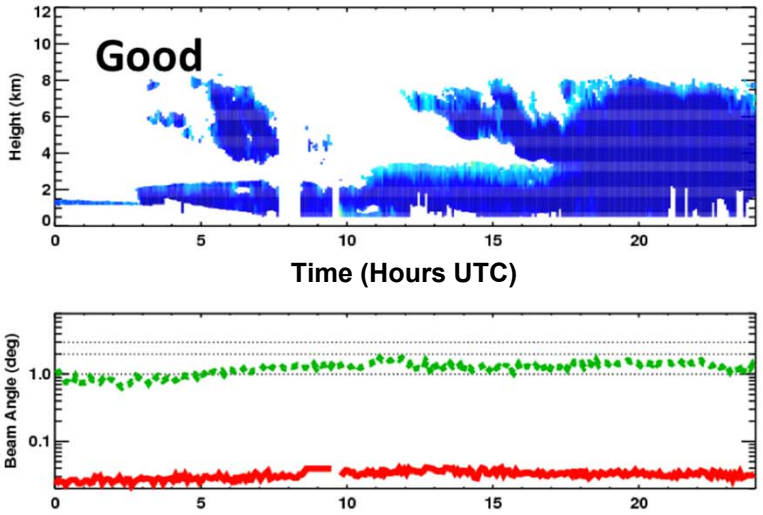
Extra Slides

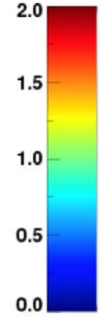
Can we gauge how well the MDV correction is doing? Is the MDV correction affected by the beam angle of the MWACR?

Day from V1, leg 1: 20171031



Day from V1, leg 2: 20171124



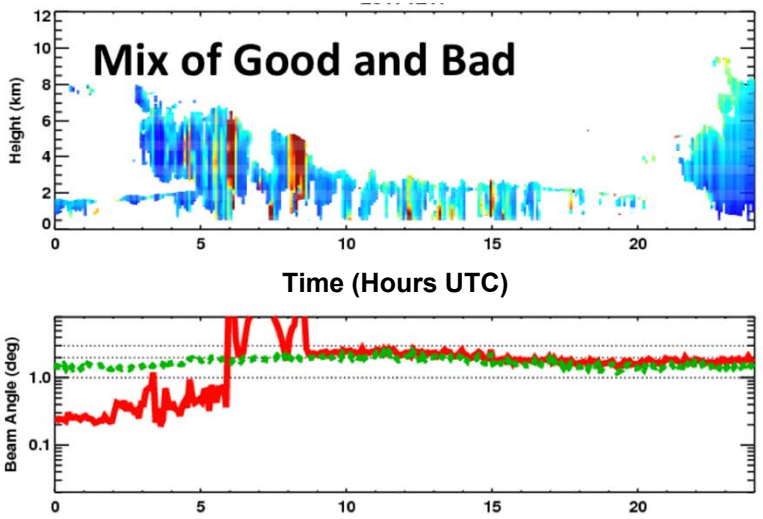


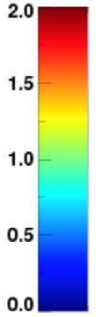
Take a standard deviation of the corrected MDV to get a texture of the field.

Despite natural variability:

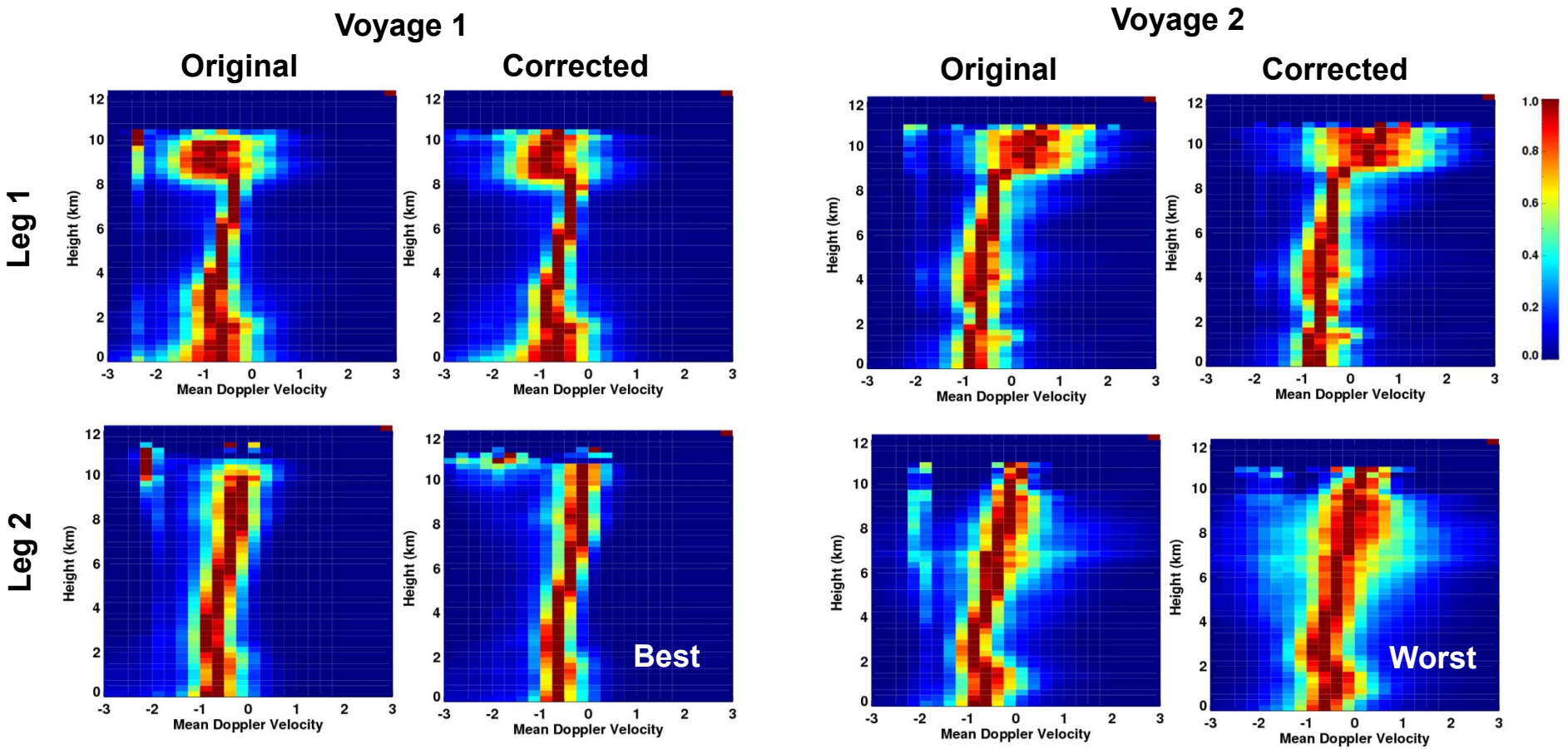
- **A higher standard deviation may indicate the correction is not as robust as we'd like it to be.**
- **A lower standard deviation could give us greater confidence in the correction.**

Day from V2, leg 1: 20171217





CFADS of original and corrected MDV



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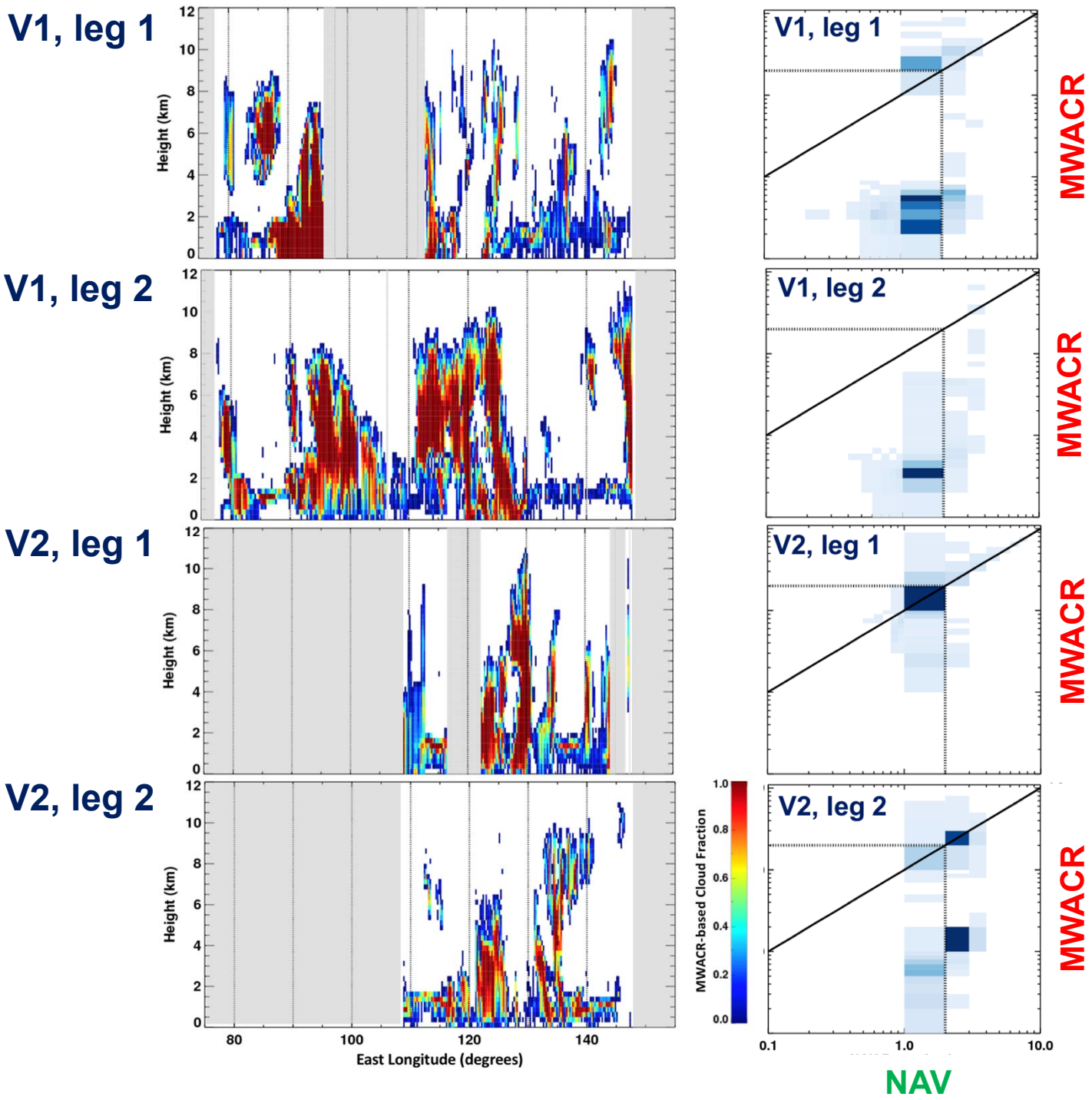
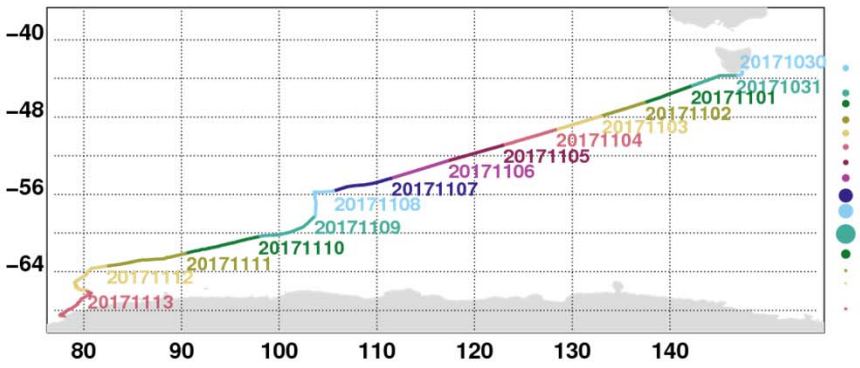
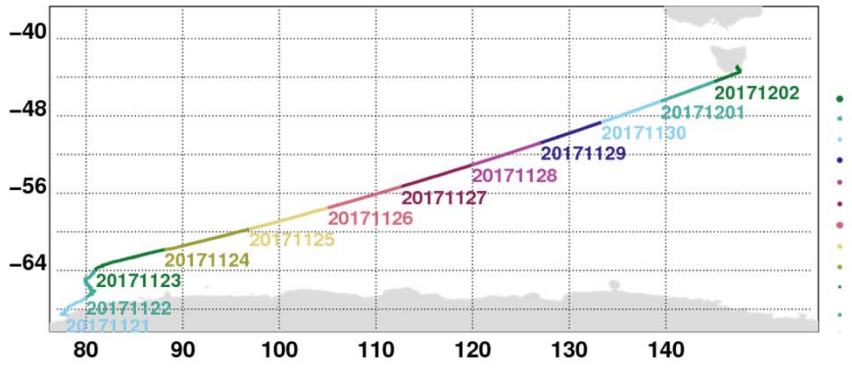

V1, leg 1
V1, leg 2
V2, leg 1
V2, leg 2
Height (km)
East Longitude (degrees)
MWACR-based Cloud Fraction
MWACR
NAV


−40
−48
−56
−64
80
90
100
110
120
130
140
20171030
20171031
20171101
20171102
20171103
20171104
20171105
20171106
20171107
20171108
20171109
20171110
20171111
20171112
20171113


−40
−48
−56
−64
80
90
100
110
120
130
140
20171202
20171201
20171130
20171129
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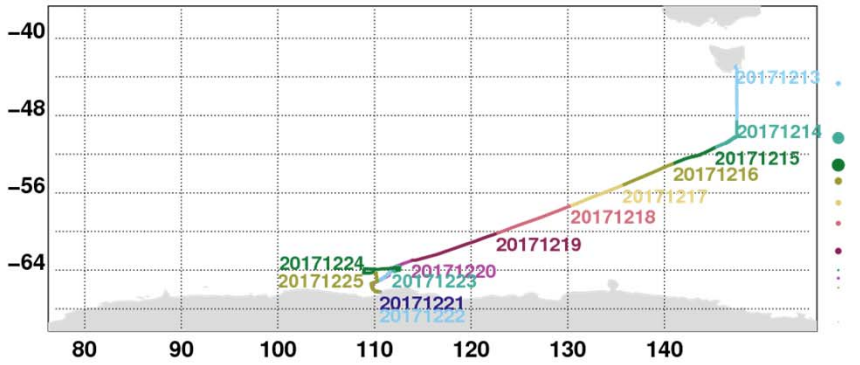
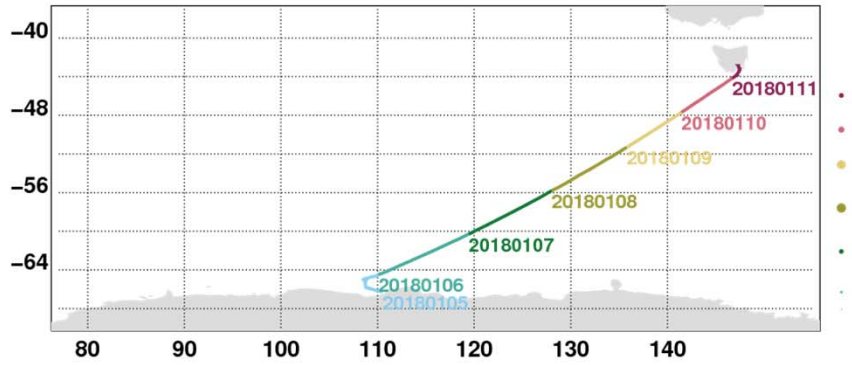
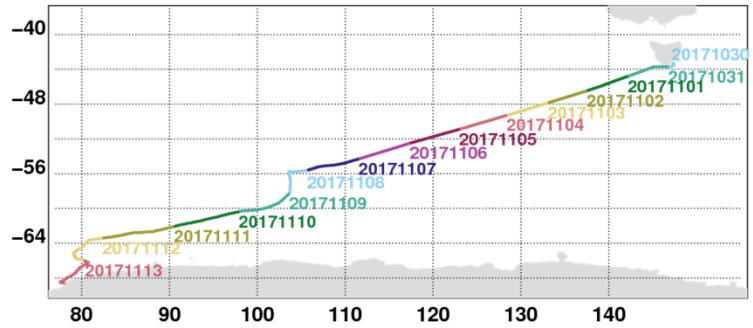
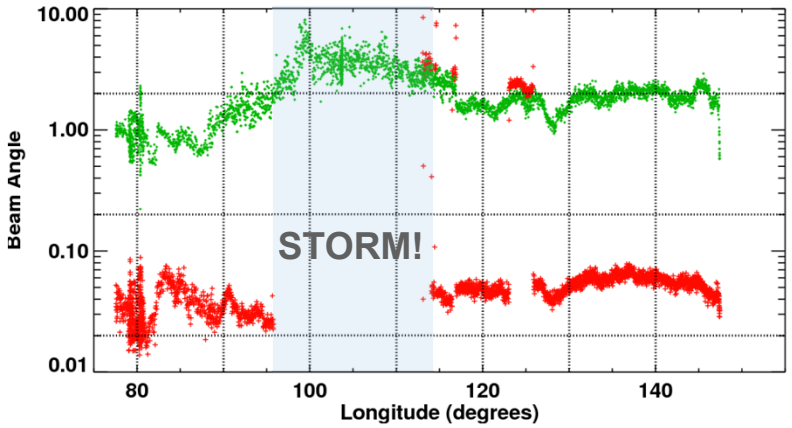
20171123
20171122
20171121

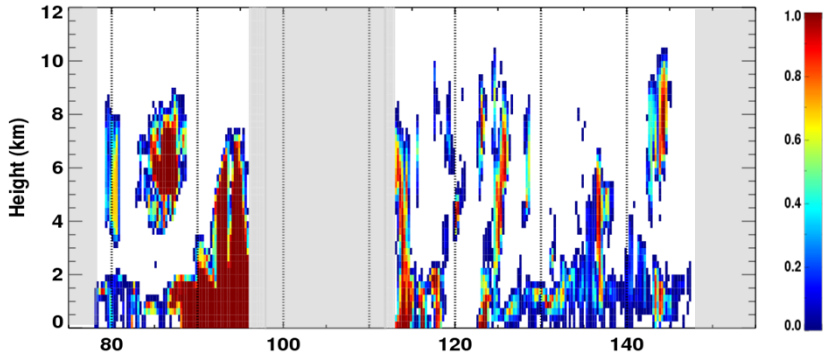

−40
−48
−56
−64
80
90
100
110
120
130
140
20171213
20171214
20171215
20171216
20171217
20171218
20171219
20171220
20171221
20171222
20171223
20171224
20171225

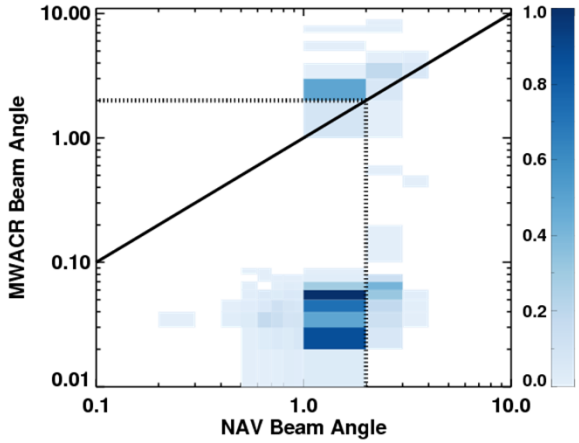

−40
−48
−56
−64
80
90
100
110
120
130
140
20180111
20180110
20180109
20180108
20180107
20180106
20180105

How will the different beam angle situations affect the **MDV correction? Need to look at the clou**ds.

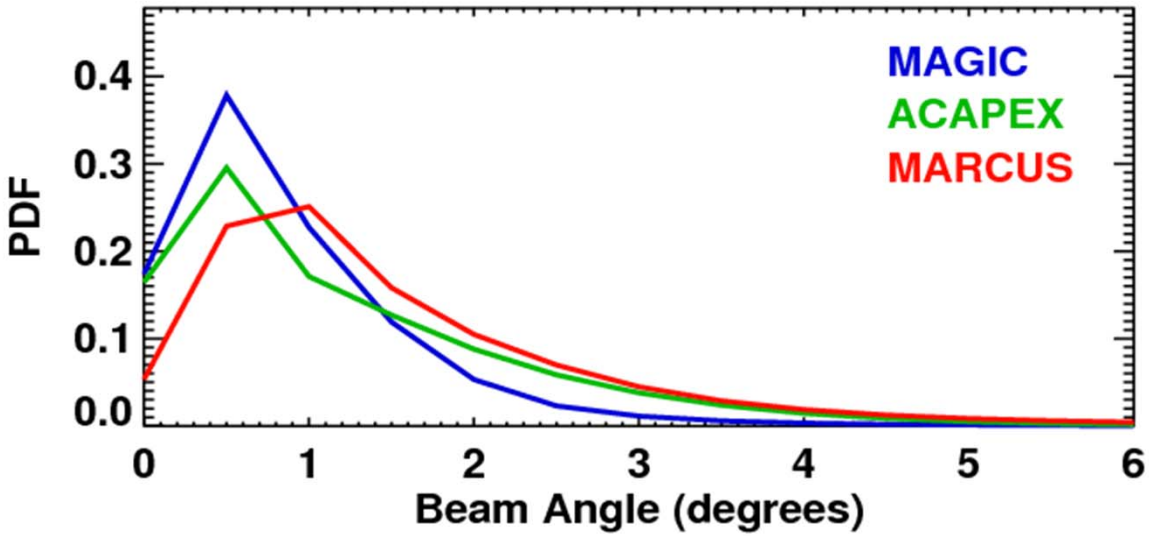


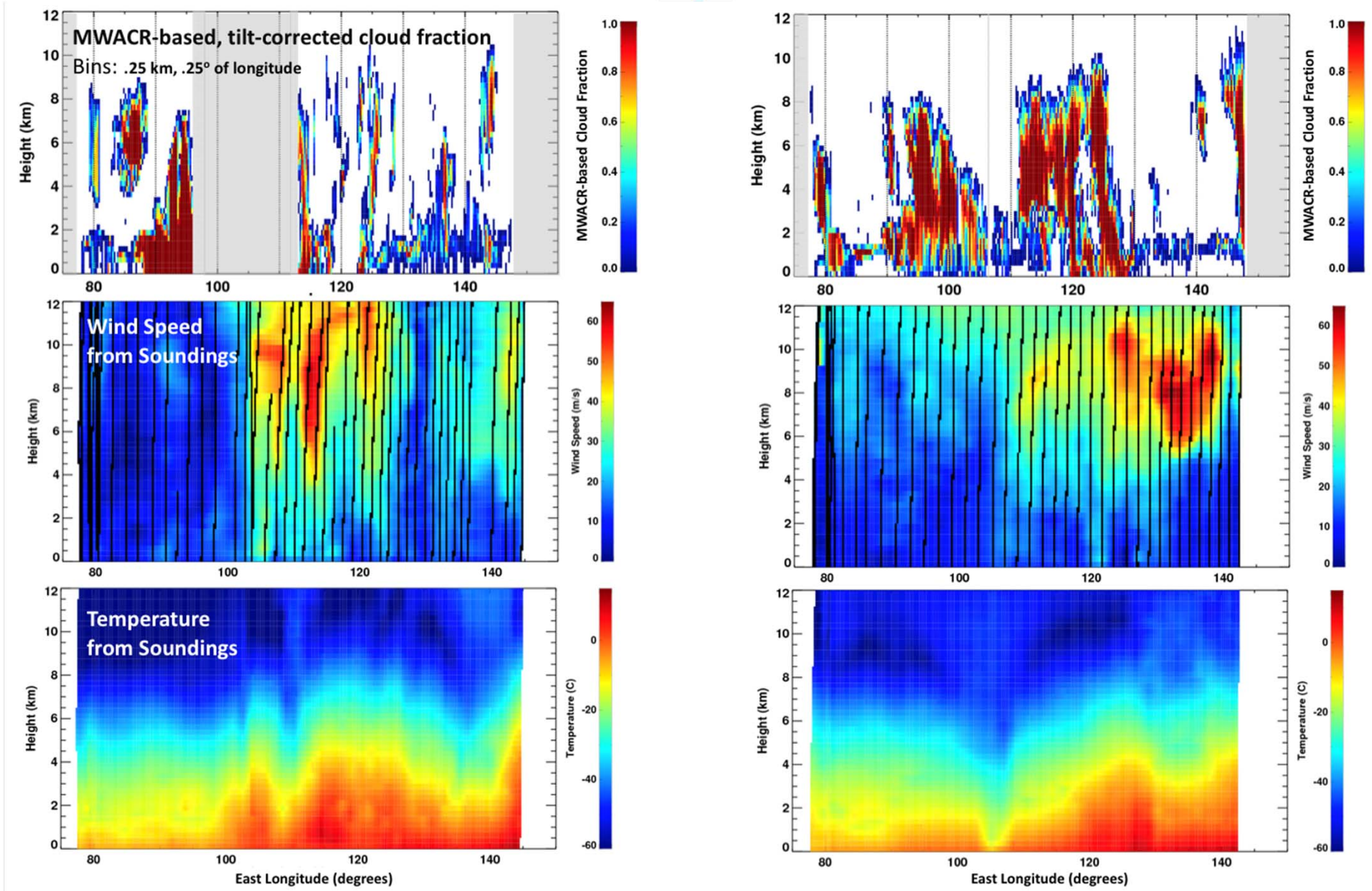


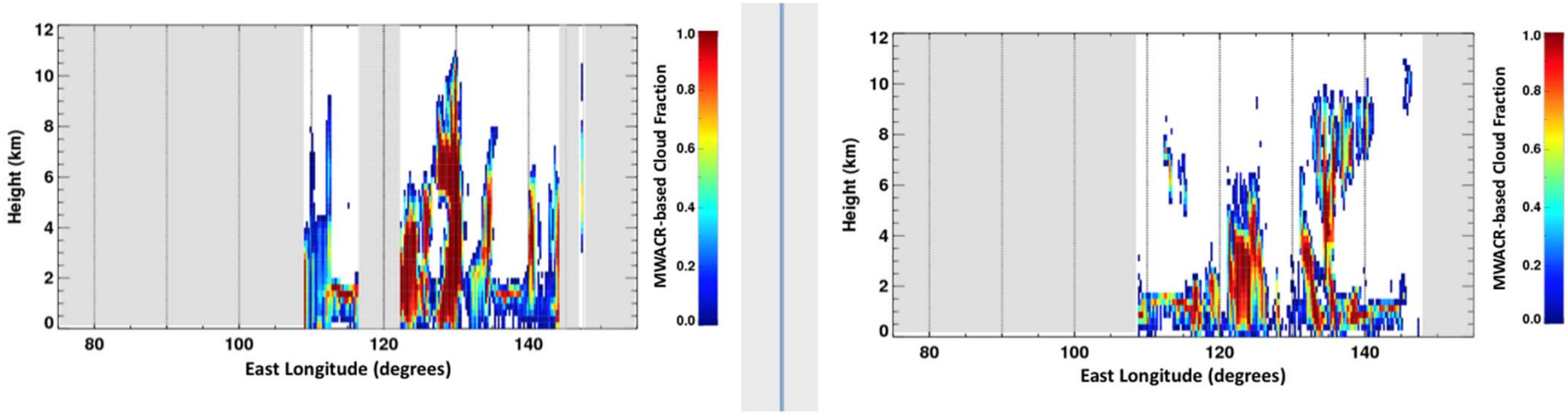


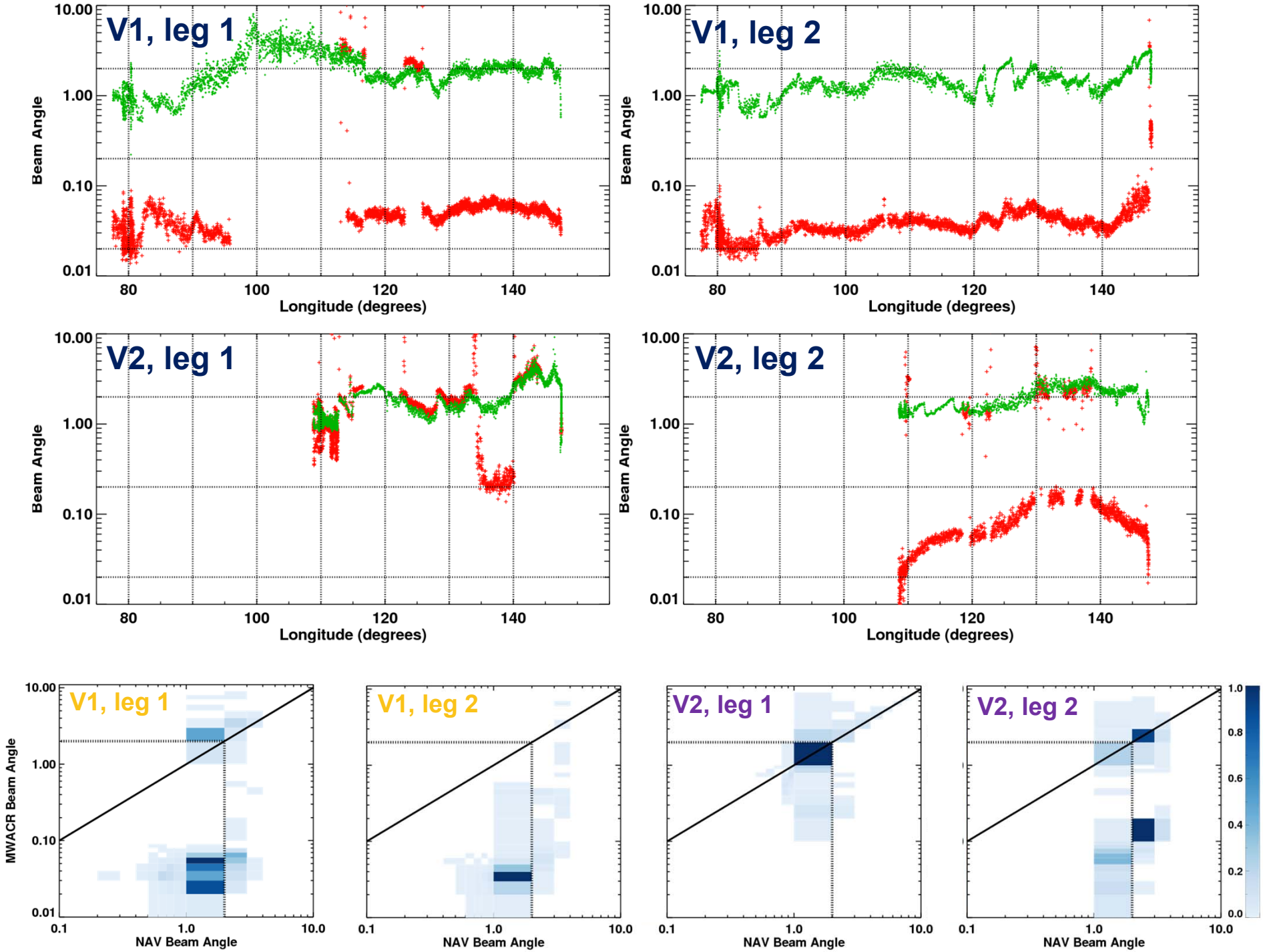


MWACR-based,
tilt-corrected hydrometeor fraction
from MWACRARSCL
(0.25 km, 0.25° of lon)

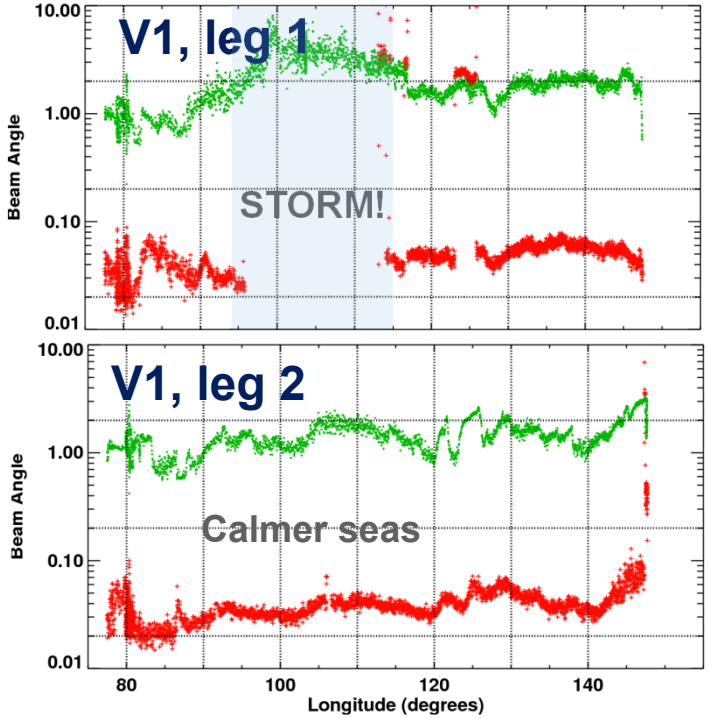

MAGIC
ACAPEX
MARCUS
PDF
0.0
0.1
0.2
0.3
0.4
0
1
2
3
4
5
6
Beam Angle (degrees)

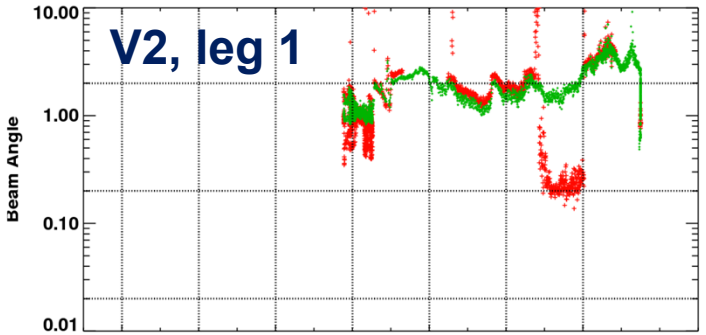

MWACR-based, tilt-corrected cloud fraction
Bins: .25 km, .25° of longitude
Height (km)
MWACR-based Cloud Fraction
Wind Speed
from Soundings
Wind Speed (m/s)
Temperature
from Soundings
Temperature (C)
East Longitude (degrees)

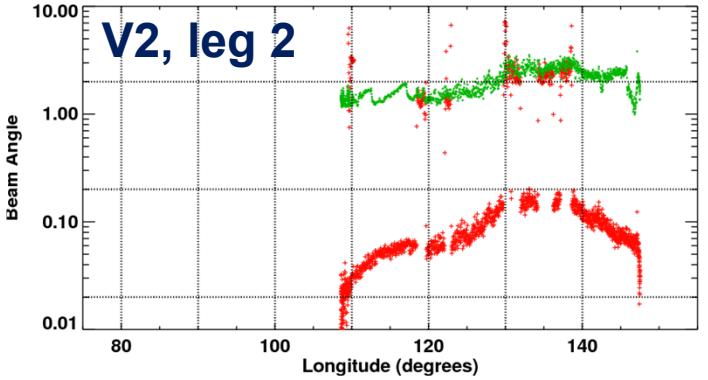
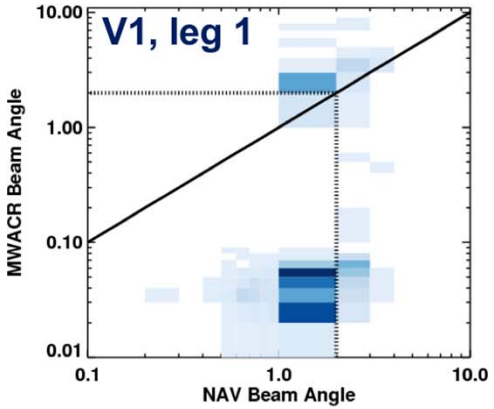
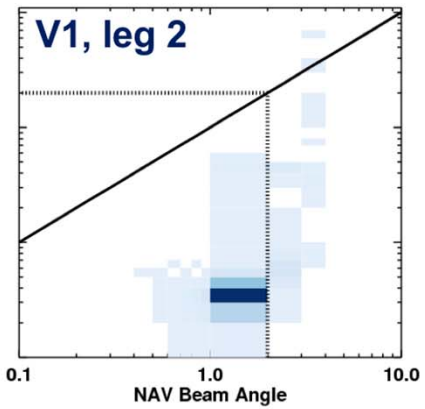
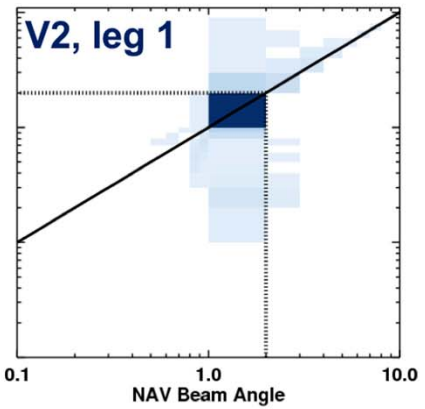
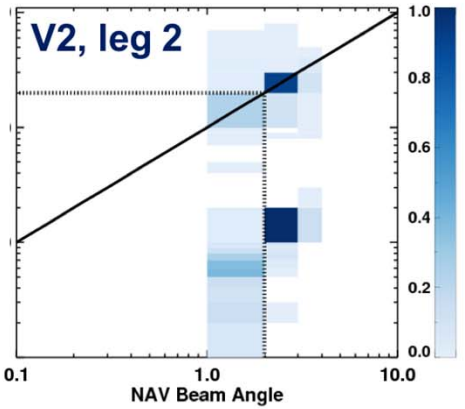

Height (km)
East Longitude (degrees)
MWACR-based Cloud Fraction
0
2
4
6
8
10
12
80
100
120
140
0.0
0.2
0.4
0.6
0.8
1.0


V1, leg 1
V1, leg 2
V2, leg 1
V2, leg 2
Beam Angle
Longitude (degrees)
10.00
1.00
0.10
0.01
80
100
120
140
MWACR Beam Angle
NAV Beam Angle
0.1
1.0
10.0
0.0
0.2
0.4
0.6
0.8

Now let's look at MWACR's beam angle for each leg ... there are several situations







NAV
MWACR